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SOME FACTORS ASSOCIATED WITH POPULARITY

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The task which was undertaken by this research was that of finding, if possible, some of the factors associated with popularity. The general problem is to determine the causes of social adjustment or maladjustment, and to ascertain what teachers and others can do to control those causative factors. This broad problem, however, is very difficult to undertake as a whole, chiefly because it is so poorly defined. A very cursory review of the literature will disclose that, at present, the terms 'social adjustment' and 'personal adjustment' are chaotically tangled in meaning, while the nature of desirable social adjustment is a confused mixture of popularity, friendship, leadership, sociability, social participation, social adaptability (tact), social intelligence, social competence, and social maturity. Beyond these elements of personal interaction are still more general elements such as competition and coöperation which are frequently included under the heading of social adjustment.[1] A clarification of word meanings and of values would contribute much at this time to progress in the understanding of social adjustment. Until such clarification is accomplished, the term 'popularity' is probably as meaningful a synonym for social adjustment as can be found. In spite of much superficial use of the word in everyday conversation, it succeeds better than most words in meaning the reaction stimu-

[1] A helpful survey of viewpoints toward social adjustment is presented by Wright, Verne. "Summary of Literature on Social Adjustment," *American Sociological Review*, VII (June, 1942), 407–22.

lated in others by a given personality. The term places an emphasis on the 'social' part of person-to-person relations. Furthermore, popularity either involves or implies most of the other elements of face-to-face social adjustment. Popularity probably facilitates friendship, sociability, and social participation; it implies social intelligence, social maturity appropriate to the group, social competence, and social adaptability; above all, it signifies successful application of whatever abilities are involved in achieving social approval. Consequently, popularity provides a promising approach to the problems of social adjustment.

PRESENT APPROACHES TO THE STUDY OF POPULARITY

Opinions about the characteristics which enable a person to win friends and influence people are abundant, but research has only begun to probe this complex area. During recent years, however, four highly significant avenues of investigation have been opened and explored. The first of these is the use of class and caste status as a framework within which to analyze social relationship.[1] A second approach is the 'peer culture' study whereby the developing social relations of boys and girls are observed over a period of time, particularly in relation to other developmental characteristics.[2] Experimentation with 'social climate,' developed by Lewin and others, is a third research procedure yielding findings pertinent to social adjustment.[3] A fourth major avenue of investigation is that of sociometry—the study of the attractions and rejections which individuals express or feel toward one another.[4]

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[1] For example, see Warner, W. Lloyd, Havighurst, Robert J., and Loeb, Martin B. *Who Shall Be Educated?* New York: Harper and Brothers, 1944, pp. xii + 190.

[2] For example, see Meek, Lois Hayden and Others. *The Personal-Social Development of Boys and Girls with Implications for Secondary Education.* New York: Committee on Workshops, Progressive Education Association, 1940, pp. 243.

[3] For example, see McCandless, Boyd Rowden. "Changing Relationships between Dominance and Social Acceptability During Group Democratization," *American Journal of Orthopsychiatry,* XII (July, 1942), 529–35.

[4] See Moreno, J. L. *Who Shall Survive: A New Approach to the Problem of Human Interrelations.* Washington, D. C.: Nervous and Mental Disease Publishing Co., 1934, pp. xvi + 440.

Also see Jennings, Helen Hall. *Leadership and Isolation.* New York: Longmans, Green and Co., 1943, pp. xv + 240.

For a brief, elementary description of the sociometric technique, see

In order to find the factors associated with popularity, two difficulties must be met. First, some index of popularity must be obtained which will identify individuals who are socially successful. Second, factors must be selected which may have significance in relation to popularity, and the extent of association for each factor must be determined. In the study being reported, the sociometric technique was used to determine the popularity of four hundred eighteen school children, and the extent of association with popularity for each of thirty-three factors was measured. The following report (1) reviews previous investigations of factors associated with popularity, (2) describes the way in which the sociometric procedure was used in this study to locate popular and unpopular individuals, and (3) presents and discusses the data obtained in this study on the association between popularity and thirty-three factors.

PREVIOUS INVESTIGATIONS OF FACTORS ASSOCIATED WITH POPULARITY

An impressive amount of research work has already been accomplished to determine the basis of popularity. One of the frequently used methods of investigation has been to apply rating scales and 'Guess Who' tests as measures of behavioral and other factors. These rated scores on various attributes have then been compared to popularity scores obtained by sociometric or other techniques, in order to find related factors.[1] Investigations of

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Elliott, Merle H. "Patterns of Friendship in the Classroom," *Progressive Education*, XVIII (November, 1941), 383–90.

For an earlier application of a similar technique, see Almack, John C. "The Influence of Intelligence on the Selection of Associates," *School and Society*, XVI (November 4, 1922), 529–30.

[1] Perrin, F. A. C. "Physical Attractiveness and Repulsiveness," *Journal of Experimental Psychology*, IV (April, 1921), 203–17.

Cattell, R. B. "Friends and Enemies: A Psychological Study of Character and Temperament," *Character and Personality*, III (1934), 55–63.

Koch, Helen Lois. "Popularity in Preschool Children: Some Related Factors and a Technique for Its Measurement." *Child Development*, IV (1933), 164–75.

MacFarlane, J. W., Honzik, M. P., and Davis, M. H. "Reputation Differences Among Young School Children," *Journal of Educational Psychology*, XXVIII (March, 1937), 161–75.

Dimock, Hedley S. *Rediscovering the Adolescent.* New York: Associ-

this sort, which rely for data on the personal judgments of members of the group to which the subjects belong, secure questionable measures of the factors with which popularity is compared. If it is the opinion of members in a group that they like a certain person, then, under ordinary circumstances, that person is, in truth, popular; but the opinions of the group that the same individual is highly intelligent, handsome, conceited, or neurotic do not necessarily conform to the truth. An indeterminate amount of 'halo effect' may be assumed to extend from opinions on popularity to opinions on all other characteristics of an individual. It is a common observation that a person who is popular in a group can do no wrong. His behavior becomes the standard by which the behavior of all other members in the group is judged. His popularity shields him from criticism, while another person's unpopularity is attributed, perhaps with much unreasonableness, to supposed faults on which the group has unconsciously agreed. Not only classmates but also teachers and others who share the group life may reflect these prejudices of the group. The extent of the error introduced by the operation of 'halo effect' and unconscious group agreement is unknown, and for that very reason research methods which do not exclude it must be viewed with suspicion. As a means of establishing hypotheses for further experimentation, investigations depending on ratings can be and have been very fruitful, but they can scarcely supply conclusive

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ation Press, 1937, pp. xx + 287.

Hardy, Martha Crumpton. "Social Recognition at the Elementary School Age," *Journal of Social Psychology*, VIII (August, 1937), 365–84.

Tryon, Caroline McCann. *Evaluations of Adolescent Personality by Adolescents*. Monographs of The Society for Research in Child Development, Volume IV, No. 4. Washington: Society for Research in Child Development, National Research Council, 1939, pp. x + 83.

Lippitt, Rosemary. "Popularity Among Preschool Children," *Child Development*, XII (December, 1941), 305–32.

Hunt, J. McV. and Solomon, R. L. "The Stability and Some Correlates of Group-Status in a Summer-Camp Group of Young Boys," *American Journal of Psychology*, LV (January, 1942), 33–45.

Bonney, Merl E. "A Study of Social Status on the Second-Grade Level," *Pedagogical Seminary and Journal of Genetic Psychology*, LX (1942), 271–305.

Kuhlen, Raymond G., and Lee, Beatrice J. "Personality Characteristics and Social Acceptability in Adolescence," *Journal of Educational Psychology*, XXXIV (September, 1943), 321–40.

TABLE 1.—RELATIONSHIPS BETWEEN INDEPENDENTLY MEASURED FACTORS AND POPULARITY OBTAINED BY OTHER INVESTIGATORS[1]

Factor	Investigation					
	Hsia[2]	Hardy[3]	Dimock[4]	Hunt and Solomon[5]	Bonney[6]	Jennings[7]
Height			r = .05	r = .20		
Weight			r = −.01	r = .21		
Strength			r = −.04			
Physical condition		C.R. = *3.9*				
Athletic ability				r = .25		
Chronological age	r = −.02		r = .09 to .20	r = .18		r = .02 to .15
Intelligence quotient	r = −.14	r = *.37*	r = .19		r = .02 to *.44*	r = .04
Mental age	r = *.23*		r = *.23*			
School achievement		r = *.36*			r = *.46*	
Reading ability	r = *.22*					
Socio-economic status	r = *.16*		r = −.07			
Home and neighborhood ratings		r = *.46*				
Occupational intelligence status of parents					r = *.52*	
Sociability of parents					r = *.62*	
Cultural status of homes					r = *.63*	
Foreign language home		C.R. = 1..4*				
Mother employed outside home		C.R. = .9*				
Child employed		C.R. = 1.7*				
Broken home		C.R. = .8*				
Number of siblings		r = *−.30*				
Number of brothers		r = *.15*				
Number of sisters		r = *−.10*				
Brothers as nearest sibling		p = *.01*				
Number of years in camp		r = .05				
Duration of membership in group.						r = −.17 to .05
Number of persons habitually greeted						r = .29 to *.40*
Number of opportunities for social contact						p < *.01**
Number of choices expressed for others						r = .12 to *.30*
Sociability test	r = .11 to *.27*					
Feeling of superiority test			r = .18			
Self-criticism test			r = −.15			
Feeling of inferiority test			r = −.23			
Criticism of other tests			r = −.12			
Social insight test			r = .16			
Emancipation from parents test			r = −.11			

[1] Relationships are reported as follows: correlation, r; critical ratios of differences in terms of standard errors, CR; and probability that differences are not due to chance, p. Relationships which are significant at the one-per-cent-level are printed in italics.

[2] Hsia, Jui-Ching. *A Study of the Sociability of Elementary School Children.* Contributions to Education, No. 322. New York: Bureau of Publications, Teachers College, Columbia University, 1928, pp. 64.

[3] Hardy, Martha Crumpton, *op. cit.*

[4] Dimock, Hedley S., *op. cit.*

[5] Hunt, J. McV. and Solomon, R. L., *op. cit.*

[6] Bonney, Merl E., *op. cit.*

[7] Jennings, Helen Hall, *op. cit.*

* Derived from reported data.

results. The factors which are to be compared with social adjustment must be located by methods which are independent of the social influence of the experimental subjects.

A number of significant studies of popularity, including portions of some of those already mentioned, have obtained independent measures of factors to be compared with popularity. Table 1 presents a summary of association found by six investigations between popularity and various independently measured factors. Several factors whose relationship was not reported by a single statistical figure and which could not be converted into a single figure are omitted from this summary. Figures which indicate a statistically significant relationship at the one-per-cent-level are printed in italics in the table. It is evident that a number of significant relationships have been found by these investigations. However, that no factor has yet been located which is markedly associated with popularity.

IDENTIFYING POPULAR AND ISOLATE CHILDREN

For the present study of the factors associated with popularity, each child in several classrooms was asked to select the three other pupils in the room he would most like to have (a) live with him in his home for a few days, (b) sit next to him in school, and (c) attend a party with him. Hence, nine choices were expressed by each child. Data were collected from four hundred eighteen pupils of grades V, VI, VII, and VIII in eleven classrooms of four public schools in a suburban city of California.

The number of times each child was chosen by his classmates provided a measure of his popularity in the group. Credit was given for having received a choice regardless of whether it was a first, second, or third choice. Although each pupil made nine choices, it was possible for a child to make his selection without naming more than three individuals, and this frequently occurred. In such cases, credit was given for each mention without any penalty for duplication. Since the study eventually concerned itself only with extreme cases, these simplified procedures of scoring were thought to be sufficiently accurate. By these methods of scoring, some pupils in each class were chosen from fifteen to twenty times, while other pupils did not receive a single vote.

The assumption is not made that high popularity constitutes good social adjustment. There is the distinct possibility that too much popularity is as harmful to the individual as too little popularity. Social adjustment of any kind which is too comfortable may be harmful.[1] It may be that teachers should make every child feel the security of some popularity and also the insecurity of some social rejection. Nevertheless, the need for an understanding of the forces underlying popularity remains, and this need sets the task with which we are concerned.

The fact that the pupils were asked to select only members of their classes is not considered a defect in the resulting measure of popularity. It is assumed that a socially adjusted individual should establish good social relations with every major group to which he belongs. Children who work and play together for a major portion of every schoolday over a period of one or more years should, if they are developing satisfactorily, be willing and able to win some share of the special regard which the group has to offer.

When the choices were requested, the pupils were told that their answers would not be revealed. Although signed papers were obtained, this promise of privacy appeared to be accepted in good faith. There was no advance warning about the questions, and there was no communication between the children while the choices were being made. It was explained that a scientific study of friendships was being made and that sincere, independent judgments were needed. The pupils were conscientious in meeting these requirements.

In order to obtain two contrasting groups of pupils for the study, about five of the children with the most votes in each class were selected to form the popular group, and about five of the least popular children in each class were selected to form the opposing group. Pupils in the latter group were called isolates,

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[1] One of the concepts growing out of the class and caste status studies is the hypothesis that anxiety and tension arising from temporarily thwarted ambitions, far from being undesirable manifestations of incipient neurosis, constitute essential motivators of human development. See Davis, Allison. "Socialization and Adolescent Personality," Chapter XI, pp. 198–216, *Adolescence*, Part I, Forty-Third Yearbook of the National Society for the Study of Education, Chicago: Department of Education, University of Chicago, 1944.

since, while they were not necessarily disliked by their classmates, they were apparently somewhat isolated from intimate relationships. No attempt was made to obtain exactly the same number of subjects for each group from each class. Some classes had more isolates or more extremely popular pupils than did other classes. Certain eligible children were not included in the experimental groups. Two pupils who would have been among the isolates were excluded from further study because they were of a nationality different from the rest of the pupils. It was felt that this fact explained their isolation sufficiently well. A third was eliminated because he had been a member of his class for only a few days. Another pupil was excluded because he was of subnormal mentality. The isolate group finally selected contained fifty-two children, while the popular group consisted of forty-eight children. Thus, the groups to be studied were roughly the most popular eighth and the least popular eighth of the four hundred eighteen children. The actual number included in any particular test of the two groups was often less than the total number in experimental groups because of absence from a test or incompleteness of school records. Hence the number of cases included varies somewhat from test to test.

The two groups were compared in thirty-three different ways in an attempt to locate factors related to popularity. In each case the two groups were measured with respect to a factor; the mean, the standard deviation, and the probable error of the mean was computed for each group; and the difference between the means of the two groups was noted. The probable error of the difference between the means was then calculated and its critical ratio obtained. Whenever the critical ratio exceeded 4.0, the difference found between the two groups was considered statistically significant. The factors can be grouped conveniently under four headings. They will be described in terms of that arrangement.

AGE, HOME BACKGROUND, LENGTH OF ASSOCIATION

As was expected from the results of previous studies, chronological age and habitation in a broken home were not significantly related to popularity. Neither was socio-economic status nor number of brothers and sisters significantly related. The data

TABLE 2.—DIFFERENCES BETWEEN POPULAR AND ISOLATE GROUPS IN AGE, HOME BACKGROUND, LENGTH OF ASSOCIATION, AND MOBILITY

Factor	Group	Number	Mean (or per cent)	Standard Deviation	Critical Ratio $\left(\frac{\text{Difference}}{PE_{\text{Difference}}}\right)$
Age.....	Popular	44	11.81	1.28	1.83
	Isolate	38	11.48	1.20	
Siblings.....	Popular	44	1.41	1.47	1.19
	Isolate	38	1.16	1.24	
Only Child.....	Popular	44	(25.0%)	.....	−.98
	Isolate	38	(31.6%)	.....	
Habitation in Broken Home.	Popular	48	(14.5%)	.....	1.60
	Isolate	52	(7.7%)	.....	
Socio-economic Status.	Popular	45	22.26	6.32	
	Isolate	41	20.53	6.67	1.82
Length of Association.	Popular	44	20.14	14.68	1.82
	Isolate	39	16.32	13.68	
Mobility.....	Popular	44	1.64	1.20	−1.79
	Isolate	38	1.98	1.36	

are reported in Table 2. The Sims Score Card[1] was the instrument used in measuring socio-economic status. The significance of being an only child was found, contrary to Bonney's results,[2] to be inconsequential and in a negative direction. The direction of the critical ratio for broken homes was also somewhat surprising.[3] It might be expected that there would be more broken homes among the isolate children. The number of broken homes turned out, however, to be one of the few factors which did not produce a difference in the expected direction, however small that difference might be.

It seemed reasonable when the study was planned that popularity might depend on a long period of association with the total group of children. This hypothesis was all the more tenable since the community in which the study was being made had increased in population from about 10,000 to more than double that number during the preceding ten years, and was growing rapidly at the time the data were gathered. A closely related hypothesis was that high mobility during the formative years might either deny a child the opportunity of learning to make intimate friends or else force him to become highly skillful in winning approval.

Length of association was computed for each child from the date of admission to the school in which he was being tested, as shown in the cumulative record folder at the school. It is interesting that only eight children had been enrolled in their present schools over forty-eight months, although the children were selected from the upper grades. Thus, the great majority of the children had started first grade in some other school. Furthermore, twenty-three of the children had been in their present schools less than four months. This condition provided an excellent check of the hypothesis that length of association might be a

[1] Sims, Verner M. *Sims Score Card for Socio-Economic Status.* Bloomington, Illinois: Public School Publishing Co., 1927.

[2] Bonney, Merl E., *op. cit.*

[3] The statistics on broken homes and only children were handled somewhat differently to obtain a critical ratio. In both cases frequencies were changed to percentages, and the probable errors computed from the formula $PE_{f_p} = .6745\sqrt{\frac{f_p(100 - f_p)}{N}}$, where f_p is the frequency in percentage form. See Holzinger, Karl J. *Statistical Methods for Students in Education*, p. 243. Boston: Ginn and Co., 1928.

factor related to popularity. The results fail to indicate that it was a related factor.

Teachers and research workers might find it profitable, in spite of the conclusion which these figures suggest, to study length of association rather carefully as an element in social adjustment. Twelve children who had been with their groups less than four months were among the most popular, while eleven others who were also newcomers were still isolates. The school population as a whole in this study did not contain so large a proportion of new students. This situation suggests that the period of early acquaintance is critical for social adjustments. Perhaps child guidance could be particularly helpful during the first days of a new pupil's attendance at school. In these times of high mobility, when nearly everyone is to some extent a migrant, the problem is important.

The second hypothesis, that frequency of change rather than recency of change is a related factor, was approached by asking each child to name the previous schools he had attended. The number of schools attended was noted, and the usual statistics calculated. While the difference was in the direction of greater mobility for the isolates, it was not statistically significant.

PHYSICAL AND MENTAL CHARACTERISTICS, INTERESTS, AND ACTIVITIES

No factor in this area was found to be significantly related to popularity (Table 3). The school health records provided the three measures of physical build which were used; namely, height, weight, and bodily proportion. The latter measure was an index figure obtained by dividing weight into height. Although the isolates were both taller and heavier, they had the smaller bodily proportion indices. This means that the isolate children were insignificantly heavier in proportion to their height than were the popular children. No suitable measure of mental ability was available for the children under consideration, nor was it convenient to administer even group mental tests. It was possible, however, to obtain comparable educational quotients from school records. These were obtained by dividing the chronological age of each pupil into his achievement age as measured on a Stanford Achievement Test. The popular and the isolate groups were so

TABLE 3.—DIFFERENCES BETWEEN POPULAR AND ISOLATE GROUPS IN PHYSICAL CHARACTERISTICS, MENTAL CHARACTERISTICS, AND INTERESTS

Factor	Group	Number	Mean	Standard Deviation	Critical Ratio $\left(\frac{\text{Difference}}{PE_{\text{Differences}}}\right)$
Height.....	Popular	43	56.88	4.65	−0.76
	Isolate	38	57.39	4.35	
Weight.....	Popular	44	85.82	18.10	−1.87
	Isolate	37	91.57	22.22	
Body Proportion.	Popular	43	0.69	0.10	1.79
	Isolate	37	0.66	0.12	
Educational Quotient.	Popular	40	103.4	12.75	0.05
	Isolate	35	103.3	12.22	
Solitary Interests.	Popular	46	27.77	9.50	0.87
	Isolate	49	26.55	10.85	
Solitary Activities.	Popular	46	25.64	6.84	−0.71
	Isolate	49	26.39	8.28	
Group Interests.	Popular	46	18.03	4.84	2.72
	Isolate	49	15.80	6.88	
Group Activities.	Popular	46	14.51	4.40	
	Isolate	49	13.35	4.88	1.81

similar on this comparison that the critical ratio of the difference between the means was only .05. This result conflicts with the findings of Hsia (on reading ability), Hardy, and Bonney as reported in Table 1.

There are those who contend that social adjustment depends at least in part on breadth of interests and range of activities. The proposal may be made more specific by arguing that group or coöperative interests and activities are especially important in determining popularity, while solitary interests and activities tend to encourage isolation. An attempt was made to determine the value of this reasoning by using a questionnaire on interests and activities. On this list the pupils checked the interests they believed they had and the activities in which they participated. The interests and activities were sorted into group and solitary types and tabulations were made on that basis. It is undoubtedly true that more accurate measures of the pupils' actual behavior with respect to interests and activities could be obtained by observation. On a written questionnaire it is quite possible that isolate children would profess interests and activities which they did not have, but which they knew were popular with the rest of the children, even though the children did not know why they were being tested or to which group they belonged. The children were not even aware that there were groups. In the interests of science, all of them had been told only that they were a special group chosen to represent their classmates in a study of children of the community. The pupils were trusting enough to be satisfied with this explanation. Nevertheless, each child brought all his prejudices, his wishful thoughts, and his heartaches to every testing situation, and it is inevitable that some of these should creep into the replies regarding interests and activities. Allowance should be made for possible error, then, in interpreting the data on interests and activities. Isolated and popular children may be less alike in interests and activities than they appear to be from the figures reported.

PERSONALITY CHARACTERISTICS

It is reasonable to suppose that a tendency to dominate, a tendency to be extrovert, or a stable emotional life may be associated with popularity. These hypotheses were tested by means of the

TABLE 4.—DIFFERENCES BETWEEN POPULAR AND ISOLATE GROUPS IN PERSONALITY CHARACTERISTICS

Factor	Group	Number	Mean	Standard Deviation	Critical Ratio $\left(\frac{\text{Difference}}{PE_{\text{Difference}}}\right)$
Ascendance.....	Popular	47	17.04	3.94	−.14
	Isolate	45	17.22	4.40	
Extroversion....	Popular	47	24.06	3.50	5.10
	Isolate	45	21.40	3.90	
Emotional Stability.	Popular	47	29.14	4.40	2.32
	Isolate	45	27.22	7.00	
Self-reliance.....	Popular	46	9.68	1.97	2.12
	Isolate	49	9.11	1.92	
Sense of Personal Worth.	Popular	46	10.53	1.84	5.76
	Isolate	49	8.93	2.17	
Sense of Personal Freedom.	Popular	46	11.25	1.23	3.26
	Isolate	49	10.48	2.09	
Feeling of Belonging.	Popular	46	11.81	1.41	4.00
	Isolate	49	10.83	2.09	
Freedom from Withdrawing Tendencies.	Popular	46	10.05	2.46	1.29
	Isolate	49	9.62	2.36	

TABLE 4.—(*Continued*)

Factor	Group	Number	Mean	Standard Deviation	Critical Ratio $\left(\frac{\text{Difference}}{\text{PE}_{\text{Difference}}}\right)$
Freedom from Nervous Symptoms.	Popular	46	10.53	1.71	2.21
	Isolate	49	9.95	2.07	
Social Standards.	Popular	46	11.55	1.02	4.22
	Isolate	49	10.77	1.60	
Social Skills.....	Popular	46	10.64	1.63	2.44
	Isolate	49	10.01	2.08	
Freedom from Anti-social Tendencies.	Popular	46	11.23	1.34	0.96
	Isolate	49	11.03	1.67	
Family Relations.	Popular	46	11.42	1.61	2.65
	Isolate	49	10.74	2.08	
School Relations.	Popular	46	11.42	1.42	4.51
	Isolate	49	10.22	2.34	
Community Relations.	Popular	46	11.60	1.12	2.94
	Isolate	49	10.97	1.90	

Aspects of Personality Test.[1] The comparisons thus made possible produced the first statistically significant difference found (Table 4). With a critical ratio of 4.93, there was almost cer-

[1] Pintner, Rudolf, Loftus, John J., Forlena, George, and Alster, Benjamin. *Aspects of Personality.* Yonkers, N. Y.: World Book Co., 1937.

tainly a real difference between the popular and the isolate groups with respect to extroversion as measured by the Pintner test. If these findings are generally true, the question arises as to just how extroversion is related to popularity. Does it cause popularity, is it the result of popularity, or is the relationship maintained in some other way? This question in turn suggests others. For example, if a certain amount of extroversion will gain status for a friendless child, how can the teacher or the parent manipulate the situation to develop extroversion? Would an increase in the number of social contacts, the number of persons habitually greeted, and the number of choices expressed for others constitute sufficient extroversion to improve popularity, as Jenning's figures (Table 1) suggest? Such questions as these arise repeatedly for factors found to be associated with popularity. Perhaps the first step to be taken is that of locating the factors, but certainly there are many more steps necessary for full understanding.

An array of personality factors studied by means of the California Test of Personality[1] includes self-reliance, sense of personal worth, sense of personal freedom, feeling of belonging, withdrawing tendencies, nervous symptoms, social standards, social skills, freedom from anti-social tendencies, family relations, school relations, and community relations. In each case a standard has been set by the test, and the child is asked to answer questions which reveal the degree to which he fits the standard. His score is a numerical measure of the distance he has travelled toward the standard. The popular and the isolate children were definitely different in four of these factors. The difference in school relations is what would be expected, since the children were selected because of their ability or inability to attract attachments at school. This test involves teacher-pupil relations, as well as pupil-pupil relations, but the element of similarity in the tested characteristic and in the selection of the group is obviously large.

Some interesting questions arise in connection with sense of personal worth as a factor related to popularity. If it is a causative factor, teachers should be able to make a fundamental contribution to child development by encouraging in each child a

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[1] Thorpe, Louis P., Clark, Willis W., and Tiegs, Ernest W. *California Test of Personality-Elementary Series.* Los Angeles, California: California Test Bureau, 1939.

sense of personal worth. Would this give to each child the confidence necessary to establish good relations with his contemporaries? An affirmative answer fits the democratic view of life very well, and it is the one which modern education has increasingly given. If loss of self-confidence is a result of lack of popularity, rather than a cause, is it a good result? It may be that a low sense of personal worth is an automatic adjuster which functions to goad isolated individuals to re-establish themselves with a group. On the other hand, many people would maintain that a lack of reasonable self-confidence over an extended period of time is crippling enough in efficiency and happiness to be prevented if possible. There are, of course, questions with reference to how much and by what means teachers can help a child to maintain self-confidence which a group situation does not itself support. Resourceful teachers will undoubtedly find much that they can do without waiting for nicely qualified research answers, if they feel loss of self-confidence involves serious harm to the child.

That isolate children feel they do not belong may simply mean that they recognize they are not popular. However, the relationship between the two may not be that simple. It may be that there are aspects of a child's background, real or imagined, which make him feel he should not try to make friends. This relates feeling of belonging closely to sense of personal worth. In view of the evidence, teachers might do well to explore self-confidence thoroughly when working with children seriously deficient in social adjustment.

Social standards, involving a recognition of the rights of others and an appreciation of what is regarded as right and wrong, have not been neglected in schools. It would be flattering to think that the schools teach these matters so well that many children discriminate of their own accord against the laggards. Explanations that raise more difficult problems are equally plausible. Low social standards may be either the violent contortions of an individual desperately trying to establish himself or the outward expressions of persistent inner resentment. If such behavior is a product of isolation, teachers will be interested in making sure that every child has a friend and that new children are promptly welcomed into the real intimacies of the class group. On the other hand, if low social standards are the cause of isolation,

teachers will have another good reason for dealing vigorously with character education.

A review of the evidence on personality factors prompts one further observation. With the exception of ascendance, the comparisons all give differences in the expected direction. In each case the popular children had slightly more of what is generally considered good personality. The possibility is suggested that patterns of difficulties, rather than single difficulties, cause or result from unpopularity.

PERSONAL APPEARANCE, VOICE, AND CLOTHES

The factors clustering around personal appearance were studied as somewhat of an after-thought in this research, and approached without much enthusiasm. It did not seem that facial appearance, clothing, or voice could be decisive factors in the popularity of grade-school children, although previous research has repeatedly disclosed this possibility. Perrin,[1] in one of the early investigations of popularity, found that 'expressive behavior' (carriage, pose, nervousness, manner of walking, facial expression) was surpassed only by extent of acquaintance, in the opinion of college students, as a distinguishing characteristic of individuals eliciting personal affection. More recently, Barker reported a spectacular experiment in which he obtained preferences for seatmates from twelve strangers attending a psychology class for the first time. The strangers then rated each other by 'Guess-Who' test on several characteristics. The resulting correlation between selected seatmates and 'good-looking' was .97. Furthermore, fifty-five per cent of these seatmate choices were retained after three month's acquaintance, indicating that the first impressions based on appearance had considerable permanence.[2]

While these two experiments used college students as subjects, other workers have found personal appearance somewhat significant for grade-school children. Unfortunately, all the studies which have been located relied on ratings by acquaintances for measures of personal appearance, involving an undetermined amount of 'halo effect.' Tryon, for example, obtained correla-

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[1] Perrin, F. A. C., *op. cit.*

[2] Barker, Roger G. "The Social Interrelations of Strangers and Acquaintances," *Sociometry*, v (1942), 169–79.

tions ranging from .35 to .69 between 'Guess Who' ratings by groups of pupils on 'popular' and on 'good-looking.'[1] Hardy[2] asked the teachers of four hundred nine children in grades III through VI to rate the children on personal appearance. Two-thirds of the popular children, but only one-fifth of the isolate children, were rated physically attractive.

Teachers were asked to make the first judgment of personal appearance for the present study. Rating was done by means of paired comparisons. Each teacher was given a list of pairs of the names of the experimental pupils in the class. The pairs of names were listed twice, the two names being reversed on the second listing. The teachers were asked to check the more attractive child of each pair. They were urged to make no effort for consistent choices, but to look at both children for every comparison and to make an independent decision. It was felt this instruction might reduce the tendency to prejudice choices by using a subjective mental image rather than the real child. A good student with a pleasant personality might seem attractive to the teacher in defiance of every reality. Looking directly at the child should minimize this possibility.

As a result of the judgments, each child received a certain number of favorable votes out of a total number of comparisons. Since children in different classes were involved in differing numbers of comparisons, it was impossible to compare the number of votes directly. Consequently, the percentage of votes favorable for each child in the total number of comparisons made in his class was computed, and the popular and isolate children were compared with respect to the percentages earned. The critical ratio obtained from this comparison (Table 5) amounted to 9.08.

In order to avoid the operations of halo effect, an improvement in the technique was then devised and the comparison was repeated. It was arranged that the entire series of judgments should be repeated by the school nurse. Most of the children were relative strangers to the school nurse, yet they were accustomed to her presence in the schoolroom and would probably not exhibit unusual behavior or facial expressions which might influence the results. The same lists of pairs were used by the nurse as had been given the teachers. The result was a difference in

[1] Tryon, Caroline McCann, *op. cit.*

[2] Hardy, Martha Crumpton, *op. cit.*

TABLE 5.—DIFFERENCES BETWEEN POPULAR AND ISOLATE GROUPS IN APPEARANCE AND VOICE

Factor	Group	Number	Mean	Standard Deviation	Critical Ratio $\left(\frac{\text{Difference}}{PE_{\text{Difference}}}\right)$
Appearance (Teachers' Judgments).	Popular	48	15.61	7.03	9.08
	Isolate	50	7.06	6.78	
Appearance (Nurse's Judgment).	Popular	47	16.39	7.15	11.12
	Isolate	51	6.94	5.05	
Facial Appearance (Six Judgments).	Popular	43	15.60	6.65	8.26
	Isolate	47	8.81	4.64	
Facial Appearance (Adult Judgments).	Popular	43	15.56	7.01	6.90
	Isolate	47	9.38	5.62	
Facial Appearance (Child Judgments).	Popular	43	16.77	7.13	9.63
	Isolate	47	8.28	4.98	
Clothes (Six Judgments).	Popular	43	13.97	7.28	3.86
	Isolate	47	10.18	6.44	
Voice (Six Judgments).	Popular	43	13.60	5.70	3.46
	Isolate	47	10.99	4.84	

favor of the popular children larger than that obtained by the teachers, with a critical ratio of 11.12.

Since attractive personal appearance seemed so markedly associated with the popularity of the children, this factor was thought deserving of still more intensive investigation. Personal appearance was broken into two parts—facial appearance and clothing. A third aspect of first acquaintance, voice, was added for investigation. Three adults who did not know the children were selected to act as judges, and three children from another school who were unacquainted with the subject were also selected as judges. The same technique was used as before, with such slight modifications as were necessary to accommodate six judges. The subjects were numbered, and the judges were given pairs of numbers to check instead of pairs of names. The subjects were taken by class groups to the auditorium, where they were presented to the judges in pairs corresponding to the lists of numbers. In order to obtain a sample of voice quality, each subject was instructed to state his number to the judges. A curtain was placed at shoulder height in such a manner that only the subjects' faces were seen for the first series of 'exposures', and the judges rated attractiveness of voice and of facial appearance. Each subject appeared twice with every other subject from the same class, with position on the stage reversed for the two comparisons. When the ratings for voice and face were completed for a class, the curtain was placed so that it hung from above to the pupil's shoulders, leaving the body but not the face visible to the judges. The sequence of comparisons was then repeated for attractiveness of clothing.

The outcome of this analysis leads to the conclusion that facial appearance was somewhat more certainly associated with popularity for the experimental children than was voice or clothing. There were differences between the popular and isolate groups in voice and in clothes but the differences were not quite statistically significant. The critical ratio for the six judgments on facial attractiveness, however, was 8.26. It is interesting to note that the judgments of the three child judges closely matched the judgments of the three adult judges on facial attractiveness, but produced a somewhat larger critical ratio. The correlation between the judgments obtained from child judges and from adult judges

was .56 ± .05, indicating definite, although far from uniform, agreement.

As in the case of the other factors studied, it is interesting to speculate on the meaning of the association of facial attractiveness with popularity. Is there a cause and effect relationship between the two? If so, does facial attractiveness cause popularity, or does popularity cause facial attractiveness? The latter relationship is a possibility if facial expression plays a part in determining attractiveness. Would improvements in facial expression, in the arrangement of hair, or in other aspects of the face, aid children in making social adjustments? The evidence indicates that these are questions worthy of investigation through research analysis and in practical situations.

SUMMARY

Sociometric procedures were used to obtain popularity scores for each of four hundred eighteen children in grades V through VIII. Approximately the most popular and the least popular eighths of the four hundred eighteen cases were then selected as experimental groups.

Measures independent of the social influence of the experimental children were obtained for thirty-three factors, and differences between the popular group and the isolate group were noted for each factor. In every case a critical ratio of the difference in terms of probable errors was computed to test statistical significance. While most of the obtained differences were in the direction anticipated, only six were considered statistically significant. The popular children proved definitely to be more extroverted, to have a higher sense of personal worth and a stronger feeling of belonging, to express more acceptable social standards, to possess superior school relations, and to be more attractive in facial appearance. The most striking difference occurred for attractiveness of facial appearance. Teachers, the school nurse, and six persons who were strangers to the experimental subjects (three adults and three children) judged personal appearance by the method of paired comparisons. All judges found differences in favor of the popular children which yielded large critical ratios.

An hypothesis which is a plausible explanation to these findings is that facial appearance provides an initial, but superficial, basis

of popularity, which is later displaced by elements of behavior. Barker's findings suggest that adults, when forced to accept or reject strangers, react in this fashion. It is reasonable to suppose that young adolescents and pre-adolescents like those tested in this study are less sensitive then adults to slight differences in the behavior of associates, and consequently tend to place even greater emphasis on appearance and to retain that emphasis longer after first acquaintance. While such an explanation tends to minimize the importance of appearance as a permanent basis for popularity, it does not deny that an initial advantage is often all that is necessary to bring desirable characteristics of behavior to favorable attention.

It is evident that this study raises more questions than it answers, yet teachers and others charged with responsibility for the guidance of children will find many hints for practical application in the results of the investigation. Some of these practical suggestions have been mentioned in the discussion of the data. Man's relations with his fellow men are an everlasting source of personal concern and social significance. The harvest of social interaction ranges from great satisfaction to devastating unhappiness for the individual, and these personal emotions of content and discontent produce consequences for society which are often of the utmost importance. It is not surprising, then, that teachers in schools are urged to give social adjustment a preferred place among the objectives of education. The generalizations of this and other investigations do not chart the path which educators must follow, but promising methods of procedure for child guidance in social adjustment are indicated.

GRAPHIC INSTRUCTION IN RELATIONAL REASONING

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Although there have been many studies designed to evaluate the ability of children to engage in rational processes, few have been concerned with the best way to teach children the use of sound logic. This emphasis on measurement rather than on teaching has led to the implication that a child cannot reason logically until he has matured, and then in some mysterious fashion he suddenly acquires the ability.

If reasoning ability is largely the product of endowment and maturation, we should be justified in selecting or rejecting children for intellectual training simply on the basis of measured ability. If, however, one accepts the proposition of Dewey ([4] pp. 1–22) that logic is a social discipline which develops progressively with individual experience, there should be ways of teaching children to put into practice the various procedures of which logic must be composed. If the ability to be aware of, and to manipulate, the relationships expressed by such words as is, is-not, if-then, only, and, or, and some-all, comes suddenly and without formal teaching, all the teacher can hope to do is to sit and watch for the appearance of the ability to reason. If, however, reasoning is dependent upon individual experience, it should be the business of the psychologist and educator to search out the best methods for teaching children to reason and to apply such teaching at the proper time.

This research is concerned with a simple aspect of this general problem. Can a child be taught to perform the processes involved in a simple relational syllogism by means of graphic representations of the comparisons involved in the syllogism? It is generally recognized that Euler's circles, which are designed to remove some of the obscurities involved in discerning relations of inclusion and exclusion, have facilitated syllogistic reasoning for many adults.[12] Why cannot simple diagrams make it easier for young children to discern the implications of simple and direct relationships?

SETTING OF THE PROBLEM

Many persons have been interested in the development of thinking in children. Jean Piaget,[10] Susan Isaacs,[7] Victoria Hazlitt,[6] Long and Welch,[9] and Jean Deutsche[3] have all written concerning the development of reasoning ability. Piaget[10] says that at the year level seven–eight there is an awareness of relationship but that formal reasoning cannot be performed until the eleven–twelve year level. Hazlitt[6] says that children do have a knowledge of relationships at seven years, but believes that their vocabulary is so limited that they cannot express such relationships until a later age. Taken together these two statements suggest that it might be possible to substitute a graphic method for the vocabulary which these children lack. It may be that the ability to discern relationships and to make inferences from them is a simpler process than has been thought and that it is the premature introduction of language which confuses the child. What may at first appear to be the inability to reason may be merely a language muddle.

A few studies have pointed out that it is possible to help children in discerning relationships and to think logically by means of formal training. Kreezer and Dallenbach[8] taught children the meaning of opposite. They found that fifty per cent of the children succeed in learning this relationship at five and one-half years of age. They concluded that children do not ordinarily learn the meaning of opposites until the end of the eighth year. White[11] equated two groups of thirteen-year-old-children for intelligence and, with one group, added one hour of logic per week to the usual grammar lessons. At the end of three months it was found that the class having the lessons in logic made appreciably higher scores in tests of reasoning. Glaser[5] performed an experiment similar to that by White and also found a significant difference between his experimental and control group.

The conclusion from these studies seems to be that children can be made to improve in their ability to reason by means of training. Our problem is to follow this conclusion with an attempt to find the best way to conduct such teaching. Burach[1] has suggested that the only specific method for such training which has been proposed by anyone is the method of visualiza-

tion. In addition, Chen[2] says that when his subjects solved relational syllogisms they used imaginal cues. His subjects used digits, lines, or their fingers to represent the three items in the argument.

A synthesis of these studies and suggestions makes it seem reasonable that the graphic representation of the relationships involved in a relational syllogism should simplify the learning of the logical processes involved.

GENERAL PROCEDURE

The general procedure was to test the ability of children with a set of relational syllogisms, follow this with training in performing such syllogisms by means of diagrams, and then to test for the effect of such training by giving them a final set of syllogisms comparable with the first set. Control groups at each grade level were given the same sets of syllogisms, (a) the preliminary test syllogisms, (b) those used in the training period, and (c) the final test syllogisms. The only difference between the treatment of the experimental and the control groups was that the experimental groups received instructions by means of graphic diagrams in the training period, while the control groups were permitted to struggle along with no help of any sort.

An example of the type of syllogism used in the experiment is:

> Dorothy has a bigger book than Marie
> Alice has a bigger book than Dorothy
> Who has the smallest book?

Throughout the experiment these syllogisms were referred to as riddles. In the preliminary test period, ten of these riddles were presented on a sheet of paper without any printed instructions to an entire class of children. After each child had received his paper, the children were asked to follow on their papers as each riddle was read aloud by the experimenter; and time was given after the reading of each syllogism for the children to answer on their papers. This procedure kept the class together and standardized the time taken for each riddle.

After the entire ten preliminary test problems had been finished, the papers were collected and a second sheet of five

syllogisms was passed out. To those in the experimental group the syllogisms in this second group were explained by means of diagrams on the blackboard; whereas the control group were permitted to do them with no graphic representation and no interpretation other than the reading as had been done in the preliminary test.

An illustration will make clear the type of instruction which was given in the training period. After collecting the papers

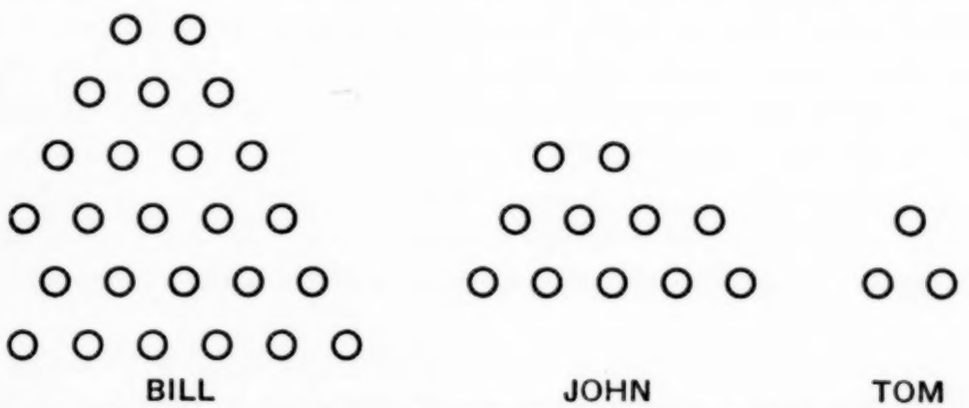

FIG. 1.—Graphic representation of relational syllogism. Explanation in text.

following the preliminary test, and passing out the second set, the experimenter said:

"Were the riddles hard for you to do? Well, I am going to show you a way to do them that will make it much easier for you to do them. Look at the one on your paper. It says,

'John has fewer marbles than Bill
Tom has fewer marbles than John
Who has the most marbles?'

"Let's make a picture of it. John has fewer marbles than Bill, so we will say that this is John's pile of marbles and this is Bill's pile. (Experimenter draws the piles of marbles as shown in Figure 1.) Now it says also that Tom has fewer marbles than John, and so we will draw Tom's pile so that it will be still smaller than John's pile. Now, we have all three piles drawn. The riddle says, Who has the most marbles? So pick out the largest pile of marbles. Whose pile is it? That's right. It's Bill's pile. Therefore, Bill has the most marbles."

All subjects were from the Oakton School in Evanston, Illinois.* The syllogisms were given to one room at a time. The school is set up so that there are three rooms for every grade. Two rooms of each grade were used as experimental rooms and one as a control room. All children from I-A to VI-A were tested.

EXPERIMENTAL DESIGN

The number of items used in the entire experiment was determined after a preliminary check to determine how many items could be completed in one school period. This check led to the use of ten items in the preliminary test, six in the training set, and ten in the final test.

Care was taken to see that in the first and last sets of syllogisms there was the same degree of abstractness, the same number of words, and the same order of relationships between the terms of the syllogisms.

To make certain that no child who might be able to do any of the problems would be overlooked, the work was carried down to the first grade. However, since so few of the first-grade children did anything at all, the statistical analysis begins at the second grade.

An analysis of variance was made between the control and experimental group for all grade levels from II to VI. A significant difference between the control and the experimental group was interpreted as giving support to the conclusion that the instructions had helped the children.

RESULTS

The results are given in Table I. The number of syllogisms which a child answered correctly was taken as his score. Since there were ten syllogisms in both the fore-period and the final period, ten is the highest possible score that a child could obtain.

One fact stands out clearly in this table; namely, with advance in school grade, children improve in their ability to solve relational syllogisms. The average scores progress from about 5 at the second-grade level to around 9 at the sixth-grade level.

* The experimenters wish to thank Mrs. Agnes L. Sanders and Miss Caroline Hesselbaum for their gracious and generous help in conducting the experiment.

Another fact is that, even though some of the differences between the fore-period and the final period are not statistically significant, they are all in the positive direction. This could be interpreted to mean that merely being given syllogisms to manipulate may increase a child's skill in such reasoning.

What about the effect of our graphic instruction? It seemingly had no significant effect upon the performance of the children in the second, fifth, or sixth grades. The differences found for these grades between the fore-period and the final periods were not large enough to be significant for either the instructed or the

TABLE I.—COMPARATIVE PERFORMANCES OF INSTRUCTED AND NON-INSTRUCTED GROUPS

Grade	No.	Fore-period	Final period	Diff.	t	sig.
Instructed						
II	47	4.91	5.64	0.73	1.34	>5%
III	45	6.11	7.09	0.98	2.53	<1%
IV	53	7.04	8.25	1.21	3.35	<1%
V	34	8.24	8.91	0.67	1.77	>5%
VI	42	9.02	9.50	0.48	1.78	>5%
Non-Instructed						
II	33	5.12	5.27	0.15	1.52	>5%
III	25	6.32	6.84	0.52	1.16	>5%
IV	20	6.10	7.25	1.15	2.05	<5%
V	22	7.23	7.86	0.63	1.07	>5%
VI	26	8.42	8.50	0.08	0.51	>5%

uninstructed group. At the fourth-grade level the difference between the two periods for the instructed group was significane at the one per cent level; that is to say, there is not one chance in one hundred that this difference could have occurred by chance. But, at the same time, the difference between the fore-period and the final period for the non-instructed group was significant at the five per cent level. This might be interpreted to mean that at the fourth-grade level children are likely to profit by

practice in performing the logical processes involved in relational syllogisms, but that this practice is a little more effective when accompanied by graphic instruction.

At the third-grade level, the scores of the control or non-instructed group do not show a significant difference between the two periods but the instructed group does show a difference which is significant at the one per cent level.

Putting all these factors together, our results seem to show that the critical periods for learning relational syllogisms are the third and fourth grades and that the graphic instruction is a factor in facilitating this learning; because, at the third-grade level the superiority of the students who received this instruction is most striking, whereas at the fourth-grade level, the effect, while still present, is not so striking. Children in the second grade are probably too young to profit by such instruction and children in the fifth and sixth grade do not need it.

In evaluating the significance of these results it should be recognized that the amount of instruction given to the experimental group was very small in amount. All that was done was to explain graphically how to solve six relational syllogisms, a procedure which consumed about twenty minutes of school time, and by a group rather than individual procedure. The experiment was done as an exploratory venture. Our findings suggest that more work along this line should prove fruitful. It might be well to take different relations, work out the best way to help the child visualize each, teach him to think relationally without the use of words, and then attempt to determine the best way to teach him to associate the correct word with the relational procedure so that he would not become confused. The experimenters suspect that children frequently use relational words with but a confused sense of their functional meaning and are given credit for being poor thinkers when they are really poor linguists. Furthermore, it is possible that they are poor linguists through no fault of their own, but merely because the relationships were not made clear before the introduction of the words which the teacher believes should express those relationships. In other words, this experiment, if followed by more work along the same line, may indicate that the teaching of relational words before the child understands the relationship involved may be more confusing than helpful.

SUMMARY AND CONCLUSIONS

The question which this experiment was designed to answer was whether children could be taught to do relational syllogisms when taught by a graphic demonstration at an earlier scholastic level than they would ordinarily be able to perform them without such instruction. A control and an experimental group were used for each grade level from II to VI.

The experiment was presented to the children in three parts. The first part was a preliminary test of ten relational syllogisms presented without any explanation as to how they should be done. The second part consisted of six relational syllogisms. The experimental group received graphic demonstrations as to how each of these should be done, but the control group received no such instruction, merely doing these in the same manner as the preliminary test syllogisms. The third part of the experiment comprised a list of ten relationship syllogisms given to both groups.

The technique of analysis of variance was used to determine the significance of the differences between the performances of the different grades and groups on the preliminary test and the final set.

The critical periods for learning these relational syllogisms were the third and fourth grades. Those in the third grade, at the lower end of this optimum learning range, profited most from the graphic instruction they received. This result may be interpreted to mean that graphic instruction facilitates learning to manipulate relational syllogisms. Children at the second-grade level apparently did not profit from graphic instruction and children in the fifth and sixth grades were already so proficient that they did not benefit by such teaching.

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SELECTION OF FEMALE ENGINEERING TRAINEES*

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This paper presents data showing the effectiveness of a number of psychological instruments for selecting female engineering trainees. The subjects were eighty-six engineering cadettes of the Radio Corporation of America, who attended a ten-month electronic engineering course[1] at Purdue University preparatory to entering jobs as engineering aides in six manufacturing plants of the company. The course started on May 1, 1943, and ended on February 26, 1944.

Applicants numbering approximately three hundred were recruited from a large number of colleges and universities throughout the country, from RCA employees, and through public employment offices. A staff of four recruiting officers interviewed and tested all applicants. The interviewers were previously given a one-week training course in procedures to be used and the purpose and scope of the program. The testing and interview procedure was identical for plant and outside applicants.

SELECTION

Each applicant was given the following test battery:

(1) The Wonderlic Personnel Test (general intelligence)

(2) The ACE Coöperative General Mathematics Test for High-school Students

(3) Self-Administering Interview in Radio and Electricity[2]

However, because validity of these tests had not been determined for the purposes of this program, their scores were not

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* Data for this study were accumulated by Miss Frances Tallmadge, who acted as counselor for the Cadettes at Purdue University, and Mr. C. C. Aiken, of the company's recruiting staff. The study was conducted under the direction of Mr. F. H. Kirkpatrick, Manager of Personnel Administration, RCA Victor Division.

[1] The course consisted of the following subjects: mathematics, electronics, radio laboratory, radio theory, electrical measurements, drawing, shop, radio manufacturing, communications, and AC-DC circuits.

[2] Constructed by the recruiting staff of RCA.

weighted in selection. They were used to provide objective measures of intelligence, mathematics ability, and interest in electrical work which could be considered with other data in making selections.

The interview consisted of a review of the application blank for further information and a discussion of the Cadette program. After the interview, applicants were rated on an interview form

TABLE I.—INTERCORRELATIONS FOR RATINGS AND CORRELATIONS WITH SELECTION-REJECTION

	Gr.	He	E.C.	W. Ex.	Hob.	Pers.	J.A.	Fit
Selection-Rejection	.62	.36	.25	.13	.26	.62	.70	.84
Fitness	.55	.45	.40	.16	.32	.57	.61	
Job Attitude	.27	.44	.00	.12	.29	.64		
Personality	.40	.53	.32	.13	.44			
Hobbies	.10	.05	.29	−.06				
Work Experience	.18	.22	.02					
Extra-Curricular	.35	.14						
Health	.19							

prepared for the purpose. Ratings, based on previously agreed upon standards, were given for the items: (1) Previous school grades, (2) Extra-curricular activities, (3) Hobbies, (4) Job attitude, (5) Work experience, (6) Personality, (7) Health, and (8) Fitness. The 'fitness' rating was an overall judgment by the interviewer of the possibility that the applicant would succeed in the cadette training program at Purdue University and in the subsequent job situation in RCA.

TABLE II.—INTERCORRELATIONS FOR TESTS AND CORRELATIONS WITH SELECTION-REJECTION

	Coöp.	R. & E.	Wonderlic
Selection-Rejection	.55	.42	.62
Wonderlic Personnel	.78	.25	
Radio and Electricity	.37		

The relationship of these various devices to actual selection of cadettes is shown by Tables I and II in terms of tetrachoric correlations with selection-rejection. Intercorrelations are also presented here for interpretation of the correlations with selection-rejection. It can be seen that some of the instruments correlate rather highly with each other. The 'selected' group considered

here was all applicants approved for admission, whether they accepted or not. Of approximately three hundred women interviewed, one hundred ten were considered acceptable for the course. Differences between mean scores for selected and rejected groups were significant at the one-per-cent level for all the tests and ratings used. It can be seen from Table I that much weight in selection was given to the interviewer's overall 'fitness' rating. As a result we had a somewhat more heterogeneous group with respect to the tests than would have been the case had they been used more rigidly in selection.

In addition to tests given during recruitment, the selected cadettes took the Kuder Preference Record and the American Home Scale[3] upon their arrival at Purdue. Follow-up studies were planned to evaluate the instruments used in terms of training and on-the-job success.

EVALUATION

The Criteria: The degree of success in the training course is taken as indicated by the cadettes' total course grade point aver-

TABLE III.—DISTRIBUTION OF GRADE POINT AVERAGES FOR CADETTES COMPLETING THE COURSE

GPA	Frequency
5.5–5.9	4
5.0–5.4	11
4.5–4.9	18
4.0–4.4	20
3.5–3.9	12
3.0–3.4	8
	$N = 73$

ages (GPA). The averages were determined for each cadette by multiplying each subject grade by the number of hours' credit for the subject, summing these products, and dividing the sum by the total number of hours credit for all subjects. An indication of the reliability of these averages is shown by the fact that final

[3] Measure of socio-economic-cultural level of the home. See Kerr, W. A., *Measurement of Home Environment and Its Relationship with Certain Other Variables.* Ph.D. thesis, Purdue University, 1942.

grade averages correlated .81 with first semester averages. The distribution of averages is shown in Table III.

Of the original eighty-six women who started the course, seventy-three were graduated. Those who terminated are not included in the criterion of success shown by grade point averages because they left for a variety of reasons in addition to low achievement. However, since withdrawal from the course indicates job failure as far as the employer is concerned, it was desirable to set up as a criterion of success the tenure of the subjects. Of the thirteen students who left the course, five were compelled to leave by ill-health or family reasons. The other eight terminated for a variety of reasons in which low achievement and lack of motivation seemed to play a large part. These eight are taken as the 'terminated' group in subsequent comparisons of terminating students with those completing the course.

Results: Correlations were computed between GPA's and each of the tests and ratings (Table IV). The ACE Mathematics test yielded the highest single correlation (.55). Ratings on previous school grades correlated .50 as did the Wonderlic Personnel test. However, the Wonderlic and ACE tests correlated .78 with each other, which was the highest intercorrelation obtained and which later accounts for the failure of the Wonderlic to contribute to a maximum multiple correlation. Of the ratings, other than 'Grades,' only 'Personality' ($r = .32$) and 'Fitness' ($r = .38$) showed correlations with GPA which were significant[4] at the five per cent level. Each of these, moreover, is significant at the one per cent level. The Kuder Preference Record keys, the American Home Scale, and the Radio-Electricity test all yielded correlations with GPA that were too low for significance.

It must be remembered in interpreting these statistics, that the sample presented by the cadettes has been biased by selection. For example, interpretation of the correlation of the 'Grades' rating with GPA should consider that 'Grades' has shown a correlation of .62 with selection-rejection. In the case of 'Fitness', a significant correlation was obtained in spite of the fact that

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[4] The word 'significant' here applies to the probability that the correlations are greater than zero, and makes no claim of predictive significance. Cf. Lindquist, E. F., *Statistical Analysis in Educational Research*, Boston: Houghton-Mifflin Co., 1940, p. 212.

cadettes were largely chosen because they had high 'Fitness' ratings.

The multiple correlation for these measures with GPA was first calculated by including only the most objective of them (i.e.,

TABLE IV.—CORRELATIONS OF RATINGS AND TESTS WITH GRADE POINT AVERAGES

Ratings	r
Grades	.50
Work Experience	−.01
Extra-curricular Activities	.21
Hobbies	−.07
Job Attitude	.19
Personality	.32
Health	.16
Fitness	.38
Tests	r
Coöp Math Test	.55
Wonderlic Personnel	.50
Radio-Electricity	.22
American Home Scale	.18
Kuder:	
I. Mechanical	.09
II. Computational	.18
III. Scientific	.10
IV. Persuasive	.15
V. Artistic	.08
VI. Literary	.02
VII. Musical	−.02
VIII. Social Service	−.03
IX. Clerical	−.14
Maximum Multiple Correlation	
Coöp Math Test and Grades Rating	$R = .61$

tests and previous school grades). It was thought that any multiple coefficient or regression weights which included ratings would be too unreliable for future application. By means of the Wherry-Dolittle test selection technique a maximum shrunken R of .61 was obtained between GPA and a combination of the ACE mathematics test and the previous grades rating. Other tests failed to raise this correlation. Moreover, when data on

the other ratings were also included in the calculations, they added nothing to the correlation. The regression equation for predicting grade point averages from recruiting data was:

$$GPA = .019X + .356Y + 1.696,$$

where X = ACE mathematics test score (possible range 38 to 99) and Y = 'Grades' rating (possible range, 0 to 6). The standard

TABLE V.—MEDIAN SCORES FOR MOST SUCCESSFUL, LEAST SUCCESSFUL, AND TERMINATED CADETTES

Tests and Ratings	Most Successful, $N = 16$	Least Successful, $N = 13$	Terminated $N = 8$
Tests:			
Coöperative Math	75.5	60.0	49.5
Wonderlic Personnel	36.0	30.0	34.5
Radio and Electricity	25.0	23.0	18.0
Kuder Mechanical	75.5	74.0	59.5
" Computational	41.0	31.0	24.5
" Scientific	78.0	76.0	55.5
" Persuasive	48.5	55.5	74.5
" V	58.0	50.0	51.5
" VI	53.5	50.0	60.5
" Musical	18.5	22.0	22.0
" Social Service	73.0	77.0	81.0
" Clerical	37.5	40.0	40.5
American Home Scale	49.0	45.0	52.0

error of estimating GPA from these two measures was .50 grade points. Calculation of predicted GPA's for the cadette group showed that sixty per cent of the actual grades received fell within .50 grade points of the predicted grades, and seventy-six per cent fell within .60 grade points of predicted grades.

To clarify further the significance of the tests and ratings for predicting the success of cadettes, the scores of the highest ranking, lowest ranking, and terminated students were examined. Table V shows the median test and rating scores for these groups, and Table VI shows the significance of differences between the

TABLE VI.—*t* VALUES FOR DIFFERENCES IN MEDIANS AMONG MOST SUCCESSFUL, LEAST SUCCESSFUL, AND TERMINATED CADETTES*

Test	Most Successful minus Least Successful	Most Successful minus Terminated	Least Successful minus Terminated
Coöperative Math	2.86	3.64	1.62
Wonderlic Personnel	2.17	.39	1.30
Radio and Electricity	1.43	4.02	4.42
Kuder Mechanical	.21	1.52	1.32
" Computational	2.40	2.20	.98
" Scientific	.23	1.98	1.87
" Persuasive	−1.04	−3.23	−2.36
" V	.82	.48	− .13
" VI	.48	− .98	−1.24
" Musical	− .84	− .27	.00
" Social Service	− .40	− .86	− .36
" Clerical	− .39	− .53	− .07
American Home Scale	1.06	.58	1.37
Rating			
Grades	3.01	1.69	− .50
Extra-curricular Activities	2.94	2.60	.78
Work Experiences	−1.43	− .64	.57
Hobbies	− .84	−1.10	.0
Personality	2.32	1.14	−1.96
Job Attitude	1.00	.95	.0
Health	.72	.0	− .75
Fitness	2.56	.87	− .81

* Figures underlined twice are signficant at the 1 per cent level or better. Figures underlined once are significant between the 5 per cent and 1 per cent levels.

medians. Fisher's small sample technique was used to obtain '*t*' values for the differences. In current writings, '*t*' values whose probabilities of occurrence through chance variation is less than five in one hundred are considered significant, and those whose probabilities through chance fluctuation are less than one in one hundred are considered very reliable differences. These are indicated in Table VI by single and double underlining.

Taking the difference between most successful and least successful cadettes as a criterion of validity for predicting success, we find that differences significant at the one per cent level were obtained for the ACE mathematics test, and ratings for 'grades' and 'extra-curricular activities.' Differences significant at the five per cent level were obtained also for the Wonderlic Personnel test, the Kuder Preference Record, computational key, and ratings for 'personality' and 'fitness.'

Taking the difference between least successful and terminated cadettes as a criterion of validity for predicting turnover (since low achievement as a factor in turnover is then at a minimum), we find that only the Radio and Electricity test shows a difference significant at the one per cent level. At the five per cent level there was a significant difference in favor of terminated cadettes on the Kuder Preference Record, persuasive key.

Differences between most successful and terminated cadettes are more difficult to interpret. Some combination of ability and motivation must operate as the factor differentiating between these groups. Differences between these groups significant at the one per cent level were obtained on the ACE mathematics test, the Radio and Electricity test, and, in favor of terminated students, on the Kuder Preference Record, persuasive key. Differences significant at the five per cent level were obtained on the Kuder Preference Record, Computational and scientific keys, and on the rating for 'extra-curricular activities.'

The Radio and Electricity test was a group of simple problems designed on the theory that students with an interest in these fields would learn certain facts that are observable without formal training. The fact that the test seemed to differentiate the terminating students from those staying and seemed not to differentiate good from poor students, appears to indicate that it measured interest rather than aptitude factors.

SUMMARY

Data were analyzed from the selection and training program for eighty-six Radio Corporation of America Engineering Cadettes (female) who attended a ten-months electronic engineering course at Purdue University. The data consisted of test and rating scores, final grade point averages (GPA) for the course, and termination records. The following findings were reported:

(1) Selection was based primarily on the interviewer's overall judgments of the applicants' fitness for the program as was indicated by the 'fitness' rating.

(2) Significant correlations were obtained for the American Council on Education, Coöperative General Mathematics Test for High-school Students ($r = .55$); the Wonderlic Personnel Test ($r = .50$); previous school grades ($r = .50$); 'fitness' rating ($r = .38$); and 'personality' rating ($r = .32$).

(3) A maximum shrunken multiple correlation of .61 was found between GPA and a combination of the mathematics test and previous grades. None of the other instruments were able to increase this correlation.

(4) The regression equation for predicting GPA was:

$$\text{GPA} = .019X + .356Y = 1.696$$

where X = mathematics test score and Y = previous grades rating).

(5) Comparisons were made of high achieving students, low achieving students, and those leaving the course before its end. Significant differences were shown between achievement groups on the ACE mathematics test, the Wonderlic Personnel test, and the Kuder Preference Record, Computational key. Significant differences between low achieving and terminated students were found on the Radio and Electricity test, and the Kuder Preference Record, persuasive key.

NOTES ON THE ORIGINAL AND REVISED KENT SCALES IN THE EXAMINATION OF NAVAL RECRUITS*

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The large-scale recruiting of men for service in the armed forces during the past two years has emphasized the need for psychometric examinations which can be administered in relatively short periods of time. Psychologists engaged in military selection have been faced with the problem of the daily examination of many recruits, in an effort to eliminate those who by reason of mental defect would eventually prove to be military liabilities. This problem has been partially solved through the use of the *Kent Oral Emergency Test*,[1] which appeared in its original form in 1932. The widespread popularity of this test in military organizations is evident by its adoption in the United States at naval training stations,[2,3] Army induction centers,[4] and Army station hospitals,[5] as well as by its use in the English selection system.[6] The acceptance of the test by military psychologists is attributable in part to its brevity and in part to its demonstrated positive correlation with such well-known tests as the Stanford-Binet[7] and the Wechsler-Bellevue.[8]

The original Kent test, comprising twenty-five questions and embracing three overlapping scales of fifteen questions each, has been recently revised and shortened to include but ten questions selected from the original twenty-five. This revised version was presented as one of a battery of one-minute tests and has been described by Kent in two publications.[9,10] In the former paper tentative norms are included for use with the revision.

The present paper is a report of the results of the administration of both the original and revised scales to naval recruits referred for psychological examination in the Neuropsychiatric Unit of the Great Lakes Naval Training Station. Since the revised test consists of but ten questions, as compared with the fifteen comprising each scale of the original test, the former may

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* The opinions and assertions contained in this paper are those of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

reasonably be expected to be administered in still briefer intervals of time.* In view of the pressure of work frequently encountered in military selection, the saving of but even a few minutes in several examinations with no appreciable loss of accuracy is to be welcomed.

The subjects used in this study were two hundred white naval recruits referred for examination because of suspected psychologic disability in conjunction with the general psychological program described elsewhere.[11] Each was given the Middle Scale of the original test plus those questions not contained in the Middle Scale but included in the revision. Mental ages from the original test were derived by employing the technic suggested by Teagarden,[12] while mental ages from the revised scale were obtained from the tentative norms published by Kent. These mental ages were likewise interpolated according to Teagarden's method so that mental ages in terms of months as well as years could be calculated. This procedure was adopted with the realization that the norms were tentative and thus subject to some experimental error. In computing intelligence quotients, a basal chronological age of fifteen was used.

The chronological age range of the subjects was from seventeen to fifty-two, with a mean chronological age of 23.16 years. The range in IQ's on the original test was from 57 to 97, the mean and standard deviation being 74.66 and 8.51, respectively. On the revised test, the mean was 74.30, while the range was from 53 to 103.† The standard deviation of the distribution was 12.24. While the measures of central tendency show little variation, more scatter was evidenced on the revised test, as the standard deviations indicate. All mental levels from mental deficiency through normal were represented, with mentally retarded groups

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* It is difficult to determine accurately the reliability of this abbreviated scale since its brevity precludes satisfactory re-administration and since an alternate form is not available. A random halves analysis of the present data yielded a reliability coefficient (corrected) of .675, ± .038. This coefficient, however, does not reflect adequately the reliability of the scale because of the extremely small number of items (five) constituting each half of the test. Also, because of the arrangement of the items and the varying weights assigned them, there is no assurance that the two halves of the test were of equal difficulty.

† The mean IQ's reported in this paper are not to be interpreted as representing the mental level of the typical naval recruit.

predominating. In Table I are found mental level frequency distributions obtained on both tests, classified in terms of IQ as follows: Normal (90+); Dull Normal (80–89); Borderline (70–79); Mentally Deficient (69−). It will be noted that more recruits were classified as mentally deficient on the revised scale;

TABLE I.—MENTAL LEVEL CLASSIFICATION

Group	Original Scale		Revised Scale	
	No. Cases	Per Cent	No. Cases	Per Cent
Normal	6	3.0	23	11.5
Dull Normal	48	24.0	47	23.5
Borderline	96	48.0	44	22.0
Mentally Deficient	50	25.0	86	43.0

however, in considering the variation in the number of subjects falling within the mental levels on the two tests, the fact should be emphasized that such differences can be representative of a deviation of but one IQ point.

In Table II is found the frequency distribution of IQ differences, using the original scale as the criterion variable. Forty-three per cent of the subjects obtained scores differing by less

TABLE II.—FREQUENCY DISTRIBUTION OF IQ DIFFERENCES (±) WITH THE ORIGINAL SCALE AS THE CRITERION VARIABLE

Difference (±)	Per Cent	Cumulative Per Cent
0–4	43.0	43.0
5–9	39.5	82.5
10–14	15.0	97.5
15+	2.5	100.0

than five IQ points, in a positive or negative direction, while 82.5 per cent showed a difference of less than ten points. Variations of less than fifteen points were evidenced by 97.5 per cent, and but 2.5 per cent differed by fifteen points or more. Scores

obtained on the original scale were in general somewhat higher, with 55.5 per cent of the subjects obtaining higher IQ's on that scale. In 38.5 per cent the revised scores were higher, and in the remaining six per cent the scores were identical.

The statistical relationship between the two sets of data was derived through the application of the Pearson Product-Moment formula. The coefficient of correlation thus obtained was $r = .811, \pm .024$, indicating a substantial positive correlation between the two scales. Regression equations are as follows:

$$X' = 1.17Y - 13.0$$
$$Y' = .56X + 33.0$$

where X = the score (IQ) on the revised scale, and Y = the score (IQ) on the original scale.

The data presented in this paper have indicated that a positive correlation exists between the original and revised Kent scales, and that the mean IQ difference is relatively small. On the whole, the revised scale scores tended to be lower; however, this finding is not objectionable, since it has been observed that scores on the original test run somewhat higher than those obtained on more extensive examinations,[13,14] especially when dealing with low mental age groups. Owing to the direction of the variation, the use of the revised scale might be expected to result in the detection of more borderline cases. This may be considered advantageous in that the Kent test is usually employed not in arriving at final diagnoses, but in screening out doubtful cases for further observation and examination. Since the revised scale represents a saving in time, as well as correlating positively with the original scale, its utilization in preliminary screening examinations seems warranted.

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COUNSELEE'S RATINGS OF FORMATIVE INFLUENCES UPON VOCATIONAL CHOICE

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The rôle of the environment in affecting vocational plans has often been discussed in general terms, particularly as family, friends, and cultural traditions have set up standards of approbation, prestige or status. The amount of influence which specific environmental factors bring to bear and which factors are of most or least influence upon the area and level of choice may vary in different ethnic or cultural groups. If such factors have positive relationships to vocational plans, their recognition and weighting will be pertinent to individual vocational guidance.

Sparling,[7] dealing with a predominantly Jewish college student body, found a concentration in a limited number of occupational choices—medicine, teaching, dentistry, and law. Cunliffe[3] reported that students from bilingual homes, of foreign-born parentage, were entering mainly into medicine, law, and pharmacy. Levinger's[5] study of Jewish college students in 1319 colleges corroborates this tendency toward entrepreneur-type professions. Foreign-born and Jewish students displayed a like similarity in earning higher scholastic grades relative to ability in studies by Harris,[4] and others. In the broad view, cultural factors are shown to have a definite influence upon the area of vocational choice.

The writer[1] adapted a list of twenty items from a study by Irving S. Asch,[2] covering environmental factors, ranging outward from advice of parents and siblings to emulation of some one greatly admired and moving pictures seen. These were ranked by the subjects on a five-point rating scale, as to whether the factor was very important, important, moderately important, of little importance, or no importance in influencing their selection of a vocation. A sixth alternative was "no contact with this item." This rank order scale was included as part of a seven-page questionnaire and planned interviews with forty-nine recent high-school graduates who made application for vocational counsel and job placement to the writer at the Jewish Welfare Association in St. Paul, Minn. The subjects came from homes

that were .43 sigma ± .78 sigma below the mean on the Minnesota Home Status Scale,[6] covering a wider range in the community than would normally be expected in a social service agency. In terms of the scale, however, notably fathers' occupations, they were mainly from lower middle-class homes.

RESULTS

The factors were ranked as important (the highest three ratings) by the total group, in rank order, as follows:

1) "Reliable knowledge of my own abilities," ranked as very important by twenty, important by sixteen, and moderately important by eight. Only one subject termed it as of no importance to his choice.

2) "Talks with people not connected with the public schools," ranked as very important by only ten, but important and moderately important by fifteen and fourteen, respectively. This item had reference primarily to the vocational service of the Jewish Welfare Association where the subjects had been counseled.

3) "Advice of parents" was ranked as very important by thirteen subjects, important by fourteen, and moderately important by ten.

4) "High-school programs as a whole" was ranked as very important by only eight, but important by thirteen, and moderately important by fourteen.

5) "High-school subjects other than guidance class" was ranked by six, nine, and fifteen, respectively.

6) "Advice of a high-school teacher," was ranked by nine, twelve, and eight; "public library books or lectures," by five, fifteen, and nine; and "general reading in periodicals," by nine, seven, and thirteen, respectively.

9) "Books read in high school," assigned and unassigned, was ranked as very important by eleven, but only by nine important, and six as moderately important.

10) "Advice of a high-school counselor," ranked by nine, eight, and nine.

11) "Advice of friends," ranked by five, eight, and twelve.

12) "Advice of siblings," four, six and ten.

13) "Working at this vocation," whether Saturdays, part-time, or full-time, ranked by nine, seven, and six.

14) "Moving pictures you've seen," five, five, and eleven.

15) "Emulating someone greatly admired," ranked as very important by twelve, but important and moderately important by only three and four.

16) "Working at related fields," seven, six, and five.

17) "Advice of an employer," six, five, and six.

18) "Advice of a high-school principal," five, six, and five.

19) "High-school guidance class," three, five, and six.

20) "Advice of a clergyman," one, one, and six.

Of the forty-nine subjects, thirty-four claimed "no contact" with item 20 above, twenty-six with item 18, twenty-four with item 13, twenty-three with items 16 and 19, twenty-two with item 17, seventeen with item 15, and sixteen with item 10.

The subjects were then divided into four dichotomous groupings and chi-square statistics applied to determine the probability of the chi-square score, for one degree of freedom (using a tetrad table) being significant. The four groupings were:

1) Sex.—There were thirtv-six men and thirteen women in the sample.

2) Ability to graduate college.—This was defined in terms of the Prediction Index used at the University of Minnesota, based on the American Council on Education Psychological Examination for college freshman and high school rank weighted twice. Percentile scores between 60 and 70 have been found to be predictive forty-three times in one hundred of a C average, requisite for graduation. Sixty-five was posited as the critical score between the two groups. Twenty subjects of the forty-nine, 40.8 per cent, had percentile scores of 65 or better.

3) The statements of the subjects as to whether or not they planned on matriculation in college with the intention of completing at least a four-year course, formed a third alternative.—Twenty-seven or 55.1 per cent planned on a college course.

4) The fourth grouping was of occupations the subjects were planning on entering, classified according to the Minnesota Occupational Scale[3a], combining features of the Barr and Taussig scales. None had chosen occupations in levels IV (farming), VI (slightly skilled), or VII (unskilled). Accordingly the subjects were divided into levels I (professional) and II (semi-professional) as against levels III (skilled and clerical) and V (semi-skilled, minor clerical and business. Twenty-nine, or 59.2 per cent of the sample, were aspiring to levels I and II.

Using the five per cent limits as to the probability that a difference as great or greater would be due solely to errors of random sampling, significant differences (chi-square scores of 3.54 or larger, for one degree of freedom) were found in the following factors, arranged in the order of their assigned importance for the total group:

1) "Reliable knowledge of my own abilities"—no significant differences.

2) "Talks with people unconnected with school"—no significant differences.

3) "Advice of parents"—no significant differences.

4) "High-school program as a whole"—no significant differences.

5) "High-school subjects other than guidance class"—no significant differences.

6) "Advice of a high-school teacher"—no significant differences.

7) "Public library books or lectures"—the women subjects were influenced more according to their own statement (X^2 4.376, probability .039).

8) "General readings in periodicals"—no significant differences.

9) "Books read in high school"—the women were influenced more (X^2 7.342, probability .007).

10) "Advice of a high-school counselor"—no significant differences.

11) "Advice of friends"—those below a Prediction Index percentile of 65 and those planning on occupational levels III and V were significantly more influences (X^2s, respectively, of 9.125 and 4.882, and probabilities of .003 and .028).

12) "Advice of siblings"—no significant differences.

13) "Working at this vocation"—significant differences were found in all breakdowns except sex. Those below a PI of 65 were influenced more (X^2 16.637, probability $<.001$), those planning on levels III and V (X^2 12.376, probability $<.001$), and those not planning on a college career (X^2 5.661, probability .018).

14) "Moving pictures you have seen"—no significant differences.

15) "Emulating someone greatly admired"—those planning on occupations on levels III and V were influences more (X^2 4.044, probability .044).

16) "Working at related fields"—those below PI 65 were influenced more (X^2 9.375, probability .003), as were those planning on levels III and V (X^2 5.571, probability .019).

17) "Advice of an employer"—as in item 13, significant differences were found in all categories except sex. Influenced significantly more were those below PI 65 (X^2 9.718, probability .002), those not planning on college attendance (X^2 7.05, probability .008), and those planning on occupations on levels III and V (X^2 16.675, probability $-.001$).

18) "Advice of a high-school principal"—here, too, significant differences were found for all but sex. Those below PI 65 were influenced more (X^2 7.88, probability .006), as were those not planning on college (X^2 5.474, probability .02) and those planning on levels III and V (X^2 11.495, probability .001).

19) "High-school guidance class" those below PI 65 were influenced significantly more (X^2 7.003, probability .008).

20) "Advice of a rabbi"—the factor of least total importance to the sample was of significantly more influence to those below a Prediction Index percentile score of 65 (X^2 7.125, probability .0073), those not planning on a college course (X^2 4.167, probability .042), and those planning on occupations on levels III and V as against levels I and II (X^2 8.893, probability .0032).

CONCLUSIONS

The order of importance assigned by the counselees themselves to aspects of the environment may be a function of cultural milieu and ethnic derivation, but can be more readily shown to relate to available, local community resources. The subjects agree generally in the ranks assigned with those of Asch's sample of Jewish students at the University of Minnesota. In both samples the subjects claim consideration of occupational choice primarily on the basis of a 'reliable' knowledge of their own abilities. The importance assigned to factors, according to the subjects' own responses, decreases as the proximity to their more immediate experience, self and 'primary group' decreases.

Notable exceptions occur in relation to agencies reaching the group at the period when the necessity for making occupational plans is most urgent, the few years following high-school graduation. A 'reliable' knowledge of their own abilities, most of them acknowledged, included vocational testing and guidance, "talks with persons not connected with school"—the Occupational

Guidance Service of the Board of Education located in the main library (hence the relatively high rank assigned "public library books and lectures") and the Jewish Welfare Association service. Counsel given four or more years previous, in guidance class (in the ninth grade), is rated at the bottom of the list next to the advice of a rabbi, with which few had 'contact.' The advice of a high-school counselor, more recent and continuous, might be ranked higher with augmented personnel. Work experiences, part-time during school years and full-time after graduation, and advice of friends or emulation of others, had less influence than planned guidance.

The latter, however, and generally those factors rated as least important by the total group, were of significantly more importance to those subjects not planning on college, probably not able scholastically to perform at the required level in college, and planning on careers in the skilled trades or semi-skilled occupations. Except for admitting to more reading about occupations, the women subjects agreed with the men throughout.

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THE CORRECTION FORMULA FOR MATCHING TESTS

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Dr. Shen suggested an admirably simple formula for the scoring of matching tests in the November, 1940, issue of this JOURNAL.[1] Evidently he based his deductions on the premise of complete ignorance of the examinees. Therefore he set R-cW to equal zero. I seriously doubt whether this is the correct procedure. It is certainly not ignorance that we want to test. We aim at something more positive. We construct tests in order to measure the amount of knowledge the subjects possess.

Hence contrary to Shen's supposition, we take R to measure not so many successful guesses, but the amount of positive knowledge. But the more knowledge one possesses, the less need there is for guess work, and consequently the more likely one is to guess right if one ever has to guess. Hence the correction for W must be in some inverse function to R. It is easily seen that c equals $1/(u - R)$. Therefore our formula for scoring a matching test is

$$S = R - \frac{W}{u - R}.$$

This is essentially the formula conceived by Zubin[2] and Chapman.[3] For some excusable but unlucky slip W in the above formula was equated to $u - R$. Thus the correction term was reduced to $R - 1$, which, as Shen commented, is inadequate if not absurd. For with $S = R - 1$, everybody is penalyzed with a constant, which does not reflect the amount of guess work at all. Thus the correction cannot possibly affect the standing of anybody relative to the rest. This means that the correction is superfluous. Furthermore, for one who does not attempt any item of the test, the score will be negative according to their

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[1] Shen, E. "Note on the scoring of matching tests," *J. educ. Psychol.*, Vol. XXXI, 1940, pp. 625–626.

[2] Zubin, J. "The chance element in matching tests," ibid., Vol. XXIV 1933, pp. 674–681.

[3] Chapman, D. W. "The scoring of matching tests with unequal series of items," ibid., Vol. XXVII, 1936, pp. 368–370.

formula; and for one who has all correct, the score will still be imperfect. This again is at variance with common sense.

With our formula this will never happen. For the person who does not attempt a single item, his R will be zero, but likewise his W. Hence his score remains zero, and not negative. For the one with all matchings correctly done, his score will be $R - \frac{0}{0}$, an indeterminate score. This is perfectly in step with facts. For if one knows all but one item in a matching test, one will, nevertheless, be able to get the last item correctly matched. There is no way for us from the test achievement to differentiate this one from some other subject who really knows every item. Thus the correct score for perfect matching must be indeterminate, as our formula indicates. But for practical purpose, $\frac{0}{0}$ may be set to equal zero and one with all items correctly matched will be given a perfect score. However, this is not a serious problem, for in practice it is always the case for a good test not to allow a maximum score to be obtained, as Zubin pointed out.

Another advantage for our formula is that it takes care of omissions, too. For example, if in a 7:7 matching test, one gets three right, and only two wrong, thus with two omissions, one's score will be $3 - \frac{2}{7-3}$ or 2.5. Thus nobody is forced to attempt all the items as Zubin required. Furthermore, the correction will not remain constant. So our formula does affect the relative standing of some of the examinees at least.

Neither is our formula limited to matchings of equal series as Zubin did. The symbol U is to stand for the longer series as in Shen's paper. Indeed our formula will lead much to the same result as Shen's for cases of complete ignorance; and is practically the same as Zubin's in cases where the two series to be matched are equal and the subject gets neither a perfect nor a nil score. All other theoretical drawbacks, such as the indeterminate scores for perfect matchings and the tendency for the correction term to remain a constant, can be obviated by having one series in the matching test longer than the other. Thus our formula seems more general and more reasonable, but none the less simple and easy to score.

BOOK REVIEWS

SOLOMON MACHOVER. *Cultural and Racial Variations in Patterns of Intellect.* New York: Bureau of Publications, Teachers College, Columbia University, 1943, pp. 91.

Can differentiating patterns of subtest abilities on the Bellevue Adult Intelligence Scale be determined in three divergent groups: 1) Negro criminal groups, divergent in cultural background but equated in age and in a suitable measure of general capacity, 2) white and Negro criminal groups, matched in age, education, and IQ for the scale as a whole, 3) native white criminal and non-criminal groups, matched in age, education, and IQ for the scale as a whole? These are three general questions explored in the present investigation.

The subjects used were four hundred twenty-five males, each individually examined on the Bellevue Adult Intelligence Scale. Seventy-five of these were common to two of the three inter-group comparisons. The total number of test patterns entering into the computations on which the study was based was five hundred. All the criminal subjects were examined in the Psychiatric Clinic of the Court of General Sessions in New York County. All the groups were relatively well selected.

The method used was one that the author thinks very promising for similar studies. He labels it the 'discriminant function method.' This method is an adaptation of the multiple correlation method described by Lorge and avoids the assumption, unwarranted in a dichotomous category differentiation as Negro-white, schizophrenic-normal, etc., by the use of point biserial correlation. This method has been applied in the field of psychology very frequently and the author sees in it a potent tool of investigation in determining the psychological discriminability of personality, cultural and racial 'types' as well as of diagnostic 'types' in clinical psychopathology.

All in all, the study was well done, both in the selection and groupings of subjects as well as in the statistical methods applied. The insights and information obtained, however, are more important from the point of view of a contribution to methodology than as a contribution to the study of races of mankind. Some of the conclusions derived from the study may be summarized as

follows: There are differences between the races. The differences are the result of cultural factors. Detailed differences in test items are reported. The more specific results of the investigation are with reference to patterns of test differences rather than racial differences. Some of the more interesting conclusions of this nature are:

1) The subtest pattern of culturally very restricted southern Negroes runs counter to expectations based on the assumption that performance tests are less culture-bound than abstract verbal tests. Negroes, as a fact, do best in verbal Comprehension and Similarities and worst in performance Digit Symbol, Block Design, and Picture Arrangement.

2) The southern Negroes show marked defects in perceptual organization and in perceptuo-motor integration such as to suggest that the maturation of these functions is in large measure initially dependent on training implicit either in formal schooling or in experiences at a higher level of cultural complexity than the southern Negroes enjoyed.

3) The criminal group is reliably superior in Digit Retention and inferior in Information to the non-criminal control group. The criminal group is superior in Picture Completion and Object Assembly, inferior in Comprehension.

4) The subtests which criminals handle relatively well are among those in which pathological dysfunction is frequently manifest, while those which they handle relatively poorly often stand up well in psychopathological conditions.

The need for supplementing this study with more clinical, individual studies, the author says he realizes. But no such illustrative studies are included, not even picked case studies from the extremes. The omission makes the study less clinically enlightening and significantly limits its social utility. H. MELTZER

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AMERICAN PSYCHOLOGICAL PERIODICALS

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